

Chapter 7

Oceania

VEGETATION AND SPECIES COMPOSITION

This region includes 23 countries and areas with mangroves and stretches from the Northern Mariana Islands (at Saipan Island, about 15° north latitude) to Western Port Bay, Australia (38°22' south latitude). It includes Australia, Papua New Guinea, New Zealand and all the South Pacific islands where mangroves are known to exist.

Mangroves are commonly found in protected coastal bays, estuaries and shallow lagoons or on coral atolls. In northeastern Australia and in the Fly Delta in Papua New Guinea, they form dense and complex forests, which often extend far inland, while on some of the smaller islands such as Nauru and Niue, mangrove trees are found only as narrow belts along the coasts or in small isolated patches and stands. Some unusual mangrove communities are found on Vaitupu Island, in the coral archipelago of Tuvalu and on Christmas Island. In the first, trees grow to 6 m in height, even though the communities are almost cut off from the sea. On Christmas Island, stands of unusually tall trees of *Bruguiera gymnorrhiza* and *Bruguiera sexangula*, normally estuarine species, may be found at some 50 m above sea level at Hosnie's Spring (the world's smallest Ramsar site), and *Cynometra ramiflora* can be found at 220–300 m above sea level, on the east coast (a single stand, south of Ross Hill summit).

Mangroves in Oceania normally grow to 10–15 m, but may be taller in northeastern Australia (Queensland) and Papua New Guinea (30 m), in the Solomon Islands (25 m) and in Palau (20 m).

Mangrove biodiversity is very high in this region, and it is second only to that of Asia. As reported in Table 11, more than 50 true mangrove species grow in these countries. The greatest diversity is found in Australia and Papua New Guinea; both have more than 30 true mangrove species, including some endemic (i.e. *Avicennia integra*) and rare species (e.g. *Acanthus ebracteatus*) that are found only in these two countries. Another country with high mangrove biodiversity in the region is New Caledonia, which hosts more than 20 true mangrove species along its coasts.

One of the most notable features of mangrove vegetation in this region is the great discontinuity of the distribution of its flora. The reason for such discontinuity has long been a subject of debate (Duke, 1992; Ellison, 1995; Stoddart, 1992) and is as yet unknown.

Mangrove biodiversity in the smaller Pacific islands is significantly lower (for example only three species in Tuvalu and the Wallis and Futuna Islands, two in Nauru and one in New Zealand, Niue and Tokelau). The monospecific mangrove ecosystem found in Auckland harbour in New Zealand at 37°01' south latitude (*Avicennia marina* var. *resinifera*) is particularly interesting due to its closeness to the southern limits of world mangrove distribution (38°22' south latitude, Western Port Bay, Australia) and to its relatively simple structure.

MANGROVE RESOURCES: STATUS AND TRENDS 1980–2005

Oceania is the region with the smallest extent of mangroves worldwide (about 1 972 000 ha) (Table 3, page 10); 75 percent are concentrated in Australia (Table 12), which together with Papua New Guinea, the Solomon Islands, Fiji and New Zealand represent some 98 percent of the regional mangrove area (Figure 11). Mangrove forests and stands of a wide range of dimensions are found in this region, from the 2 ha of *Bruguiera gymnorrhiza* in Nauru (the smallest national mangrove community in the

TABLE 11
Mangrove species composition in countries of Oceania

Species	American Samoa	Australia	Christmas Island	Fiji	French Polynesia	Guam	Kiribati	Marshall Islands	Micronesia (Fed. States of)	Nauru	New Caledonia	New Zealand	Niue	Northern Mariana Islands	Palau	Papua New Guinea	Samoa	Solomon Islands	Tonga	Tokelau	Tuvalu	Vanuatu	Wallis and Futuna Isl.
<i>Acanthus ebracteatus</i>		√																					
<i>Acanthus ilicifolius</i>		√									√					√							
<i>Acrostichum aureum</i>	√				√	√			√ ^a		√						√		√			√	√
<i>Acrostichum speciosum</i>		√							√														
<i>Aegialitis annulata</i>		√														√							
<i>Aegiceras corniculatum</i>		√														√		√					
<i>Avicennia alba</i>						√			√						√	√		√					
<i>Avicennia eucalyptifolia</i>																√							
<i>Avicennia integra</i>		√																					
<i>Avicennia marina</i>		√				√					√					√		√				√	
<i>Avicennia marina</i> var. <i>resinifera</i>												√											
<i>Avicennia officinalis</i>																√							
<i>Avicennia rumphiana</i> ^b		√														√							
<i>Bruguiera cylindrica</i>		√														√							
<i>Bruguiera exaristata</i>		√														√							
<i>Bruguiera gymnorrhiza</i>	√	√	√	√		√	√	√ ^c	√	√	√			√	√	√	√	√	√	√		√	√
<i>Bruguiera hainesii</i>																√							
<i>Bruguiera parviflora</i>		√														√		√				√	
<i>Bruguiera sexangula</i>		√	√								√					√		√					
<i>Campostemon schultzei</i>		√														√							
<i>Ceriops australis</i>		√														√							
<i>Ceriops decandra</i>		√														√							
<i>Ceriops tagal</i>		√							√	√					√	√		√				√	
<i>Cynometra iripa</i>		√							√	√						√							
<i>Cynometra ramiflora</i>			√							√						√							
<i>Excoecaria agallocha</i>		√		√		√			√	√			√		√	√		√	√			√	
<i>Excoecaria indica</i>																√							
<i>Heritiera littoralis</i>		√	√	√		√			√	√				√	√	√		√	√			√	
<i>Kandelia candel</i>																√							
<i>Lumnitzera littorea</i>		√		√		√	√	√	√	√					√	√		√	√		√	√	
<i>Lumnitzera racemosa</i>		√								√						√							
<i>Lumnitzera x rosea</i>		√								√													
<i>Nypa fruticans</i>		√				√		√							√	√		√					
<i>Osbornia octodonta</i>		√																√					
<i>Pemphis acidula</i>		√						√	√	√			√			√				√	√		
<i>Rhizophora apiculata</i>		√				√		√	√ ^a	√					√	√		√				√	
<i>Rhizophora x lamarckii</i>		√						√		√								√					
<i>Rhizophora mucronata</i>		√				√	√	√							√	√		√				√	
<i>Rhizophora samoensis</i>	√			√							√					√	√		√				√

TABLE 11 (continued)
Mangrove species composition in countries of Oceania

Species	American Samoa	Australia	Christmas Island	Fiji	French Polynesia	Guam	Kiribati	Marshall Islands	Micronesia (Fed. States of)	Nauru	New Caledonia	New Zealand	Niue	Northern Mariana Islands	Palau	Papua New Guinea	Samoa	Solomon Islands	Tonga	Tokelau	Tuvalu	Vanuatu	Wallis and Futuna Isl.
<i>Rhizophora x selala</i>				√						√													
<i>Rhizophora stylosa</i>		√		√	√	√			√	√					√	√		√	√		√	√	
<i>Scyphiphora hydrophyllacea</i>		√							√	√					√			√					
<i>Sonneratia alba</i>		√					√		√	√					√	√		√					√
<i>Sonneratia caseolaris</i>		√								√						√		√					√
<i>Sonneratia x gulngai</i>		√																√					√
<i>Sonneratia ovata</i>																√							
<i>Sonneratia x urama</i>		√																					
<i>Xylocarpus granatum</i>		√		√					√	√					√	√		√	√				√
<i>Xylocarpus mekongensis</i>		√	√	√		√					√			√	√	√	√	√	√				√
Total no. of species	4	37	4	9	2	12	4	1	18	2	24	1	2	3	14	37	4	22	9	1	3	16	3

^a Uncertain.

^b Also referred to as *Avicennia lanata*.

^c *Bruguiera* sp. is reported for the country.

world) to the rich and complex ecosystem found in Australia with more than 1.4 million hectares. Although large, mangroves represent only 0.8 percent of Australia's total forest area and 0.1 percent of its total land area.

The remaining Pacific countries and areas, which often are small coral islands and archipelagos, have only very small areas of mangroves; the approximately 37 000 ha of mangroves covering the coasts of these small islands represent only 2 percent of the total regional extent and just 0.2 percent of world mangroves. Changes in these small areas do not significantly influence global figures. However, these forests are locally important and, in some cases, are the only forest habitat in the country. In Palau, to cite an example, mangroves grow on just 4 700 ha, but they represent 10 percent of the total land area.

According to the results of the present study, Oceania has lost about 209 000 ha of mangroves over the last 25 years (or about 9.5 percent of the area in 1980) (Figure 12). Even though significant, this loss is low in comparison with other regions. In absolute terms, the countries with the biggest area changes over the past two decades are Papua New Guinea, the Solomon Islands, Fiji and Australia, which are also among the five countries with the largest mangrove area in Oceania.

In Papua New Guinea, the area changes were caused primarily by human pressures for rural livelihoods, commercial activities and overexploitation of the resource (timber for housing and carvings). The extraction of fuelwood for domestic cooking and exportation contributed further to the decline of the mangrove forests of the Western Province. In the Solomon Islands, mangroves are used extensively for fuelwood and for timber for the construction of houses and boats. Overexploitation and conversion to other uses, including coastal development, have caused the majority of the losses over time. Their degradation continues, but efforts are being made to legally protect and regenerate the forests. In Fiji, the conversion to agriculture is the main cause of mangrove losses. Unfortunately, these ecosystems have minimal legal protection, and they are still threatened by increased sediment loads from upland logging, agriculture and local pollution.

TABLE 12
Status and trends in mangrove area – Oceania (1980–2005)

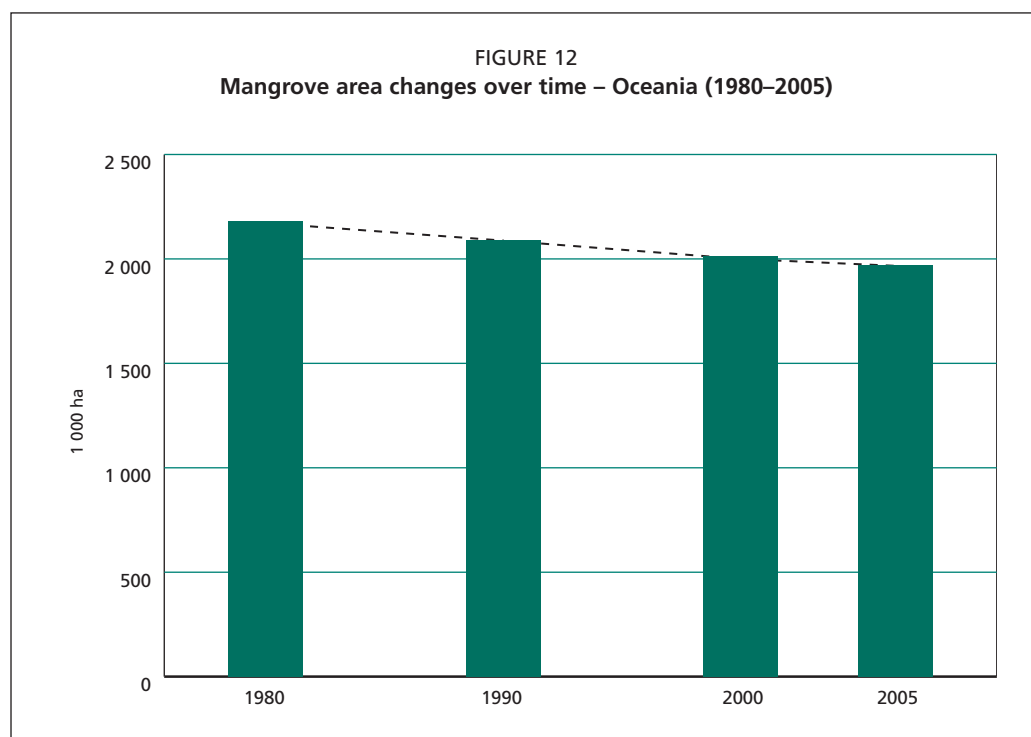
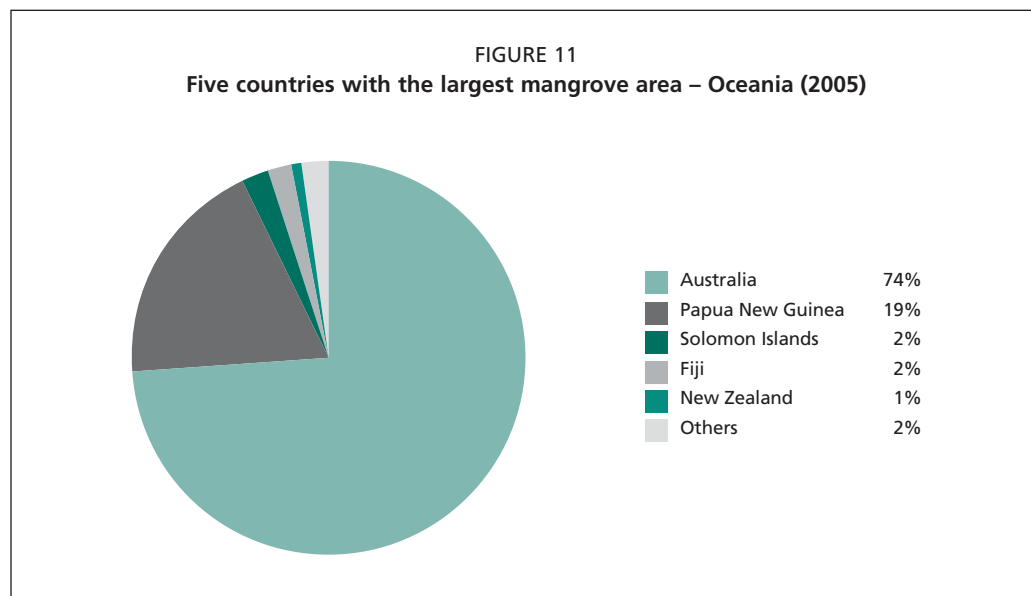
Country/ area	Most recent reliable estimate		1980 ha	1990 ha	Annual change 1980–1990		2000 ha	Annual change 1990–2000		2005 ha	Annual change 2000–2005	
	ha	Ref. year			ha	%		ha	%		ha	%
American Samoa	52	2003	75	73	n.s.	-0.3	57	-2	-2.4	49	-2	-3.0
Australia	1 451 411	2005	1 458 000	1 455 000	-300	n.s.	1 453 000	-200	n.s.	1 451 000	-400	n.s.
Christmas Island	n.a.	n.a.										
Fiji	42 464	1991	47 000	43 000	-400	-0.9	38 700	-430	-1.0	36 600	-420	-1.1
French Polynesia	n.a.	n.a.	n.a.	n.a.			n.a.			n.a.		
Guam	70	1993	88	74	-1	-1.7	60	-1	-2.1	55	-1	-1.7
Kiribati	258	1995	260	260	0	0	250	-1	-0.4	250	0	0
Marshall Islands	n.a.	n.a.										
Micronesia (Fed. States of)	8 564	1983	8 500	8 500	0	0	8 500	0	0	8 500	0	0
Nauru	2	1991	2	2	0	0	2	0	0	2	0	0
New Caledonia	17 140	2003	20 800	20 000	-80	-0.4	18 000	-200	-1.1	16 600	-280	-1.6
New Zealand	26 032	2001	28 000	26 000	-200	-0.7	26 000	0	0	26 000	0	0
Niue	3 000	1981	3 000	3 000	0	0	3 000	0	0	3 000	0	0
Northern Mariana Islands	7	1976	7	7	0	0	7	-0.1	-0.7	6	n.s.	-0.3
Palau	4 708	1985	4 700	4 700	0	0	4 700	0	0	4 700	0	0
Papua New Guinea	410 000	2000	545 000	472 000	-7 300	-1.4	410 000	-6 200	-1.4	380 000	-6 000	-1.5
Samoa	370	1999	1 000	670	-33	-3.9	370	-30	-5.8	350	-4	-1.1
Solomon Islands	50 572	1993	60 400	53 000	-740	-1.3	45 300	-770	-1.6	41 500	-760	-1.7
Tokelau	n.a.	n.a.	n.a.	n.a.			n.a.			n.a.		
Tonga	1 305	1997	1 500	1 400	-10	-0.7	1 300	-10	-0.7	1 300	0	0
Tuvalu	40	1993	50	50	0	0	40	-1	-2.2	40	0	0
Vanuatu	2 519	1993	3 000	2 700	-30	-1.0	2 500	-20	-0.8	2 500	0	0
Wallis and Futuna Islands	25	2005	25	25	0	0	25	0	0	25	0	0
Oceania	2 018 539	2003	2 181 407	2 090 461	-9 094.60	-0.42	2 011 811	-7 865	-0.38	1 972 477	-7 867	-0.39

Note: n.a. = not available; n.s. = not significant.

In relative terms, Pacific islands such as Samoa, Guam and American Samoa have experienced the largest losses of mangroves. Most of the Samoan mangroves have been extensively exploited and much of the forest that remains is degraded. In Guam, on the other hand, dredging of wetlands has been the main cause of mangrove loss, while in American Samoa, development pressures (filling, seawall construction, pollution, and dumping of waste and oil) have significantly reduced the mangrove area. Protective laws exist, but they are not well enforced. Small reforestation and protection initiatives are slowly beginning to rehabilitate the mangrove forests in Western Samoa (e.g. a small patch of mangroves was reforested in 2003 in Nu'uuli), but much remains to be done.

MAIN USES AND THREATS

On several of the smaller Pacific islands, mangroves represent the only forest type and are a source of wood for local communities. They have traditionally been used for the production of fuelwood and as timber, posts and poles for the construction of houses



and boats, which in some cases has resulted in overexploitation of the resource. In Australia, on the other hand, where there is an abundant supply of hardwood timber from other forest types, the use of mangrove wood has been very limited and several mangrove forests remain well conserved.

As in other regions, mangrove ecosystems are traditionally used for the collection of fish, shellfish and crabs. Limited areas of mangrove forest have been cleared to convert the land to shrimp farms, but this industry has not expanded as much in this region as in other parts of the world. In some Pacific countries (e.g. Fiji, the Northern Mariana Islands and Vanuatu), mangrove areas have been converted to agriculture (especially sugar production and rice paddies). Local communities on these islands also harvest and collect non-wood products from these forests, such as food, medicine and tannin. The leaves of the nipa palm are traditionally used for thatching and weaving (as in Asia) and the sap is used for the production of alcohol.

One of the primary causes of mangrove degradation and loss in this region has been the development of tourism infrastructure. In most of these countries and territories, tourism is a main contributor to the national economy, but the construction of resorts and other tourism infrastructure has often been undertaken at the expense of coastal ecosystems, including mangroves. Mangrove areas have also been cleared to facilitate urban development. Currently, several mangrove areas and other coastal ecosystems are threatened by industrial pollution, as in New Caledonia, or by domestic and solid wastes and local pollution, as in Fiji, Kiribati and Tuvalu (S.Vedel, unpublished, 2005; Maharaj, 2002; USDA Forest Service, 1998; United Nations, 1998).

MANGROVE CONSERVATION AND MANAGEMENT

Countries in the region increasingly recognize the value of healthy mangroves and are protecting these coastal ecosystems by establishing or enlarging natural reserves and parks. Some examples are found in the Northern Mariana Islands, where most mangroves are included in the American Memorial Park; in the Solomon Islands, where, even though still threatened, mangroves are protected from commercial logging and export under the Forest Resources and Timber Utilization Act; or in Vanuatu, where commercial logging of mangroves is completely banned.

Over the past decades, New Zealand has occasionally removed mangroves for coastal development and agriculture, but increased awareness of the services and benefits provided by these coastal ecosystems led to the preparation of new legislation in the early 1990s that significantly limited the clearing of mangroves. Owing to this legislation and the change of management that came into force in those years, area losses in the country decreased drastically, allowing a slight natural expansion of mangroves into new areas through the colonization of sedimented land. A similar process is occurring in eastern Australia, where in most states the clearing of natural vegetation is prevented or controlled by specific laws. Small-scale programmes of mangrove reforestation and afforestation have been recorded in New Caledonia and American Samoa.